

Issued October 7, 1910.

U. S. DEPARTMENT OF AGRICULTURE.

BUREAU OF SOILS—MILTON WHITNEY, Chief.

SOIL SURVEY OF AUGLAIZE COUNTY,
OHIO.

BY

W. J. GEIB.

[Advance Sheets—Field Operations of the Bureau of Soils, 1909.]



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1910.

[PUBLIC RESOLUTION—No. 9.]

JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided*, That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the Congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., April 13, 1910.

SIR: In the extension of the soil survey in the State of Ohio during the field season of 1909 work was undertaken in Auglaize County. The county lies in the western part of the State and the soils are few in number, though exceedingly fertile. This survey extends our knowledge of the soils in a section of the State where only one survey had previously been made.

I have the honor to transmit herewith the manuscript report and map covering this work and to request their publication as advance sheets of Field Operations of the Bureau of Soils for 1909, as authorized by law.

Very respectfully,

MILTON WHITNEY,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

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SOIL SURVEY OF AUGLAIZE COUNTY, OHIO.

By W. J. GEIB.

DESCRIPTION OF THE AREA.

Auglaize County is located in the west-central part of Ohio and is bounded on the north by Van Wert and Allen counties, on the east by Hardin and Logan, on the south by Logan, Shelby, and Darke,



Fig. 1.—Sketch map showing location of the Auglaize County Area, Ohio.

and on the west by Mercer. The territory may be further defined as included between parallels $40^{\circ} 22'$ and $40^{\circ} 42'$ north latitude and meridians $84^{\circ} 16'$ and $84^{\circ} 32'$ west longitude. Its greatest length is 30 miles from east to west and its greatest width $22\frac{1}{2}$ miles from north to south. The outline of the county is irregular, and while composed of 14 townships, only two of these contain the exact area

of 36 square miles. The county has an area of 397 square miles, or 154,080 acres.

In topography the county varies from level to rolling, though by far the greater proportion is level or undulating. The most pronounced topographic feature is a morainelike ridge from 1 to 3 miles wide, extending across the county from southwest to northeast. It traverses parts of Jackson and German townships, the northwest corner of Shelby County, and Pusheta, Clay, and Union townships. New Bremen and St. Johns are situated upon this ridge and, owing to its more marked development at the last-named place, it is called the St. Johns Ridge. To the southwest of St. Johns it is only undulating or gently rolling, but northeast from this point the topography becomes quite rolling. At several points an elevation of 1,100 feet above sea level is attained—an altitude from 100 to 150 feet above the general level of the surrounding country. A similar ridge, though much less pronounced, intersects the county, passing through St. Marys, Moulton, and Duchouquet townships. It is broken by the Auglaize River at Wapakoneta. A third ridge passes through the northwest corner of the county, but this is only a broad, gentle undulation or thickening of the glacial drift. Between these ridges and throughout the remainder of the survey the surface is level or undulating.

The average elevation of the county is about 875 feet above sea level. The highest recorded is 1,100 and the lowest about 750 feet.

Auglaize County is situated on the broad watershed between the Ohio River and Lake Erie. For a part of its course the St. Johns Ridge forms the drainage divide between the two systems. The central, northern, and western portions of the county are drained principally by the Auglaize and St. Marys rivers, both of which empty into the Maumee River, which flows into Lake Erie at Toledo. Part of the east, southeast, and southwest portions drain into the Scioto and Miami rivers, which empty into the Ohio River. Aside from these streams and their tributary creeks there is within the area a large number of open-ditch and tile drains, constructed under the ditch law of the State, which greatly assists in carrying off the surface waters.

Being on the watershed, the streams of the area are necessarily small and as none of them are swift they afford but little power. The Miami Canal, which crosses the west end of the county and passes through St. Marys, New Bremen, and Minster, affords some power at its locks, which is used in operating flour mills and manufacturing plants. This canal is fed from the St. Marys Reservoir, part of which extends into the west end of the county near St. Marys.

The first settlement in the area was made at St. Marys prior to the war of 1812. As early as 1794, however, a mission was established among the Indians at Wapakoneta by the Society of Friends. But few settlers came into the region before 1825. In 1832 a company of Germans settled at New Bremen and the next year a similar settlement was made at Minster. About the same time communities were established in various other parts of the county. The early settlers came from the older parts of Ohio, from the adjoining States to the east, and many came direct from Germany.

Auglaize County was established in 1848 and Wapakoneta, which was laid out in 1833, became the county seat. The first railroad was completed through the county in 1858 and the building of this line greatly assisted in developing the country. This is the road now known as the Cincinnati, Hamilton and Dayton.

At present Auglaize is one of the finest agricultural sections of the State, all parts of it being well settled and highly developed. The large painted barns, comfortable homes, well-kept lawns, fences, and outbuildings, and the highly cultivated fields seen throughout the county are unmistakable evidences of thrift and prosperity.

Wapakoneta, the county seat, is situated approximately in the center of the area. It has a population of 5,647 and is growing steadily. Here are located a number of prominent manufacturing industries. It is the trade center for an extensive rich farming section, which accounts largely for its general prosperity.

St. Marys, with a population of about 6,000, is located in the western part of the county. Its growth was greatly stimulated by the discovery of oil in that vicinity. It contains a number of manufacturing plants and is also in the center of a rich farming section. New Bremen and Minster, to the south of St. Marys, are two thriving country towns surrounded by good farming lands. Cridersville, New Knoxville, Uniopolis, St. Johns, Geyer, Waynesfield, and New Hampshire are other villages in the county.

The transportation facilities are adequate for the needs of this highly developed country. The main line of the Cincinnati, Hamilton and Dayton Railway traverses the county from north to south, and a branch of the Toledo and Ohio Central Railway crosses it from east to west. These roads intersect at Wapakoneta. From this point it is 59 miles to Dayton, 82 miles to Toledo, and 75 miles to Columbus. The northwest corner of the area is traversed by the Lake Erie and Western Railway, while the Detroit Southern, which is a part of the Detroit, Toledo and Ironton system, crosses the eastern part of the county through Clay and Union townships. A branch of the Lake Erie and Western extends from St. Marys to Minster.

Aside from the steam roads there are a number of electric lines. The Western Ohio Railway passes through the county from north to

south and parallels the Cincinnati, Hamilton and Dayton. From Wapakoneta there is a branch running to St. Marys, and this continues on to Celina in Mercer County. From St. Marys another branch goes to New Bremen and Minster. From Wapakoneta one can get a limited car to Toledo or to Dayton and all intervening points. Limited cars run every two hours, as do also the local cars, the two alternating. The line of the Ohio Electric Railway passes through the eastern part of the area, reaching the towns of Waynesfield and New Hampshire. It will thus be seen that nearly all points in the county are within comparatively easy reach of either a steam or electric road. The Miami Canal, which crosses the west part of the area, was formerly extensively used in shipping freight, but in late years has been abandoned, except as it furnishes power for mills and factories. Repairs are now being made and new locks have been put in at several places. It is expected that within a short time the canal will again be ready for freight service.

The dirt roads throughout the county have been piked and most of them are graveled or crowned with crushed rock. These roads are all in excellent condition and more are being improved each year. There are no toll roads in existence at the present time.

The towns within the area provide a market for the limited amount of fruit and vegetables grown. The important farm products, such as hay, grain, and live stock, are shipped to some of the larger markets, which are within easy reach. Most of the live stock goes to Pittsburgh and Buffalo.

CLIMATE.

There are no marked peculiarities in the climatic conditions of the area. Extreme temperatures seldom occur, and the rainfall is fairly well distributed throughout the year. The following table, compiled from the records of the Weather Bureau station at Greenville, shows the mean monthly, annual, and absolute maximum and minimum temperature, and the mean monthly and annual precipitation, as well as the total precipitation for the driest and wettest years, and the average depth of snow fall.

Greenville, the county seat of Darke County, which borders Auglaize on the southwest corner, being so near, the data collected there will apply equally well to this area.

*Normal monthly, seasonal, and annual temperature and precipitation at Greenville,
Darke County.*

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
December.....	° F. 31	° F. 64	° F. -10	Inches. 2.3	Inches. 3.3	Inches. 2.9	Inches. 5.2
January.....	27	65	-17	2.7	2.2	4.5	4.9
February.....	28	65	-20	2.7	0.4	1.7	3.0
Winter.....	29	.....	.....	7.7	5.9	9.1	13.1
March.....	38	73	-1	3.5	1.2	8.6	1.9
April.....	50	85	18	3.0	1.7	2.3	.5
May.....	60	91	32	3.9	1.0	3.6	Trace.
Spring.....	49	.....	.....	10.4	3.9	14.5	2.4
June.....	69	95	40	4.3	2.8	2.8	.0
July.....	73	101	46	2.9	.7	3.9	.0
August.....	70	93	45	3.1	1.5	3.4	.0
Summer.....	71	.....	.....	10.3	5.0	10.1	.0
September.....	64	90	32	2.7	1.3	2.8	.0
October.....	52	83	15	1.9	.7	4.6	Trace.
November.....	40	73	4	3.6	5.1	3.1	1.0
Fall.....	52	.....	.....	8.2	7.1	10.5	1.0
Year.....	50	101	-20	36.6	21.9	44.2	16.5

As will be seen from the foregoing table, the average annual precipitation is 36.6 inches. The greatest amount of rainfall occurs in March, May, and June, while the smallest occurs in October. The mean annual temperature is 50° F.

The following table shows the dates of the first and last killing frosts:

Dates of first and last killing frosts.

Year.	New Bremen.		Year.	New Bremen.	
	Last in spring.	First in fall.		Last in spring.	First in fall.
1902.....	May 29	Sept. 14	1906.....	May 10	Oct. 10
1903.....	May 5	Oct. 10	1907.....	May 21	Oct. 14
1904.....	May 16	Oct. 4	1908.....	Apr. 29	Oct. 3
1905.....	May 1	Oct. 12	1909.....	May 2	Oct. 15

AGRICULTURE.

As stated elsewhere in this report, the first settlement in Auglaize County was made shortly before the war of 1812, prior to which time little was known of the immediate locality, except through the information gained by early hunters and traders. The Indians who occupied this portion of the State before the advent of the white settlers had cleared small patches of ground here and there in the forest and small quantities of corn were grown.

The original timber growth consisted of oak, beech, maple, ash, hickory, elm, walnut, and sycamore, and the clearing of the land was a difficult task. Timber which would now be very valuable was cut down and burned, and crops were planted among the stumps. The first crop was usually corn, and there was more of this staple grown than any other in the early days. Wheat and oats were also grown, and hay was made from the wild grasses.

The first farms were cleared along the ridges or on slight elevations, since in these places the natural drainage was best. Between the low ridges which traverse the county the surface is level or undulating, and early reports state that in many places the natural drainage was so imperfect that considerable territory was in a swampy condition and covered with standing water during the wet months of the year. An area of this character was in the southeastern part of the county. This tract was originally sparsely timbered and too wet to be depended upon for farming purposes until large drainage ditches were dug. Throughout this region mentioned and in many small depressions, where there has been an accumulation of organic matter for a long period of time, the soil is black in color and very productive when properly drained.

Farm operations and cultural methods of the early days were rather crude. The preparation of the soil before planting was given much less attention than at present, partly because the implements used then were not capable of doing as good work as those in use now and partly because it was not considered necessary. The soil was then new and naturally productive, and there seemed to be no necessity for devoting extra time and labor to producing an especially fine tilth. With the coming of improved machinery and the knowledge that the soil unaided would not continue to produce bounteously, better methods were adopted. There never has been any radical change in the crops grown nor in the methods of culture followed, but the changes which have been made have taken place gradually and always with the result that conditions were improved.

Owing to the marked uniformity of the soil throughout the county, practically all portions of the area are devoted to the same type of agriculture—general farming. The soils, being of a clayey nature,

require more thorough cultivation and heavier work animals to do the work than sections of country with soils containing a larger percentage of sand.

Corn has always been the leading crop in Auglaize County. In 1880 the acreage was 40,047 acres, in 1890, 42,640 acres, in 1900, 51,357 acres, and in 1907, 46,936 acres. Corn matures perfectly in this latitude, and the black soil—Miami black clay loam—is reputed to be as well adapted to corn production as the black soils of Illinois and Iowa. As more attention is now being paid to selection of seed, the quality of the grain is better than formerly. The yield for the county ranges from 35 to 40 bushels per acre, though on individual farms yields of 80 bushels are not uncommon.

The acreage devoted to wheat is second only to that of corn. In 1880 the area planted was 34,982 acres; in 1890, 33,963 acres; in 1900, 48,331 acres; and in 1907, 35,359 acres. In 1908 the area planted to wheat was only 23,728 acres, and the acreage is decreasing each year. Fall wheat is grown exclusively. The yields are not as large as at an earlier period. Years ago 25 bushels was a very common yield; now from 15 to 20 bushels per acre is the ordinary range in yields.

Oats is an important crop, and the acreage is increasing. The yield for the county at large ranges between 30 and 40 bushels per acre.

Clover and timothy are grown extensively, and the Miami clay loam is well adapted to their production. Only a few small fields of alfalfa were seen. Rye, barley, millet, sorghum, and Irish potatoes are also produced, but only to a limited extent.

This locality is not especially adapted to the production of fruit, and there are only a very few commercial orchards. On many of the farms, however, there are a few apple, pear, peach, and plum trees, which usually provide enough fruit for home use. Small fruits are not grown to any extent, and there is but little trucking done in any part of the county.

Tobacco is grown on a small scale, and patches of from one-fourth acre to 2 acres were seen throughout the county. Some Connecticut leaf is grown, also a Spanish variety. The best grade is utilized for wrappers and the remainder is classed as fillers. The tobacco is grown chiefly on the Miami clay loam.

The dairy industry is not as highly developed in Auglaize County as one would expect in such a rich agricultural section. There is a large creamery at New Bremen which deserves special mention. It receives milk and cream from various points in this and adjoining counties. The butter is made by expert butter makers and always brings the highest market price. There are a number of dairies

which supply milk and cream to the towns within the area, and on most of the farms some butter is made, which is also marketed at the nearest town. While there are no large cities to supply within this county, it would seem that more creameries could be established and the product placed upon the market in the large cities.

The dairy and beef cattle seen were as a rule well bred and in good condition. The Jersey, Shorthorn, and Hereford are more plentiful than other breeds, though there are some Holstein, Red Polled, and Angus cattle in the county. A great many hogs are raised; the Duroc Jersey and Berkshire seem to be the favorite breeds. Beef cattle and hogs are shipped to Pittsburg and Buffalo.

It is recognized throughout the area that the black land—Miami black clay loam—is better adapted to the production of corn than the upland soil—Miami clay loam. It is also considered that the bottom land—Genesee loam—is better for corn than the Miami clay loam. The Miami clay loam, however, is better for wheat, oats, and grass. On the black land small grain develops too much straw and is apt to lodge.

In the rotation of crops sod is usually plowed for corn, and in the fall the field is often sown to wheat. The corn is cut and put in shocks, standing close together in rows that are as far apart as it is possible to make them. The field is then thoroughly harrowed or disked and seeded without being plowed. The strip on which the shocks stand is often sown to oats in the spring. Timothy may be seeded with the wheat in the fall. Clover is usually sown broadcast on the wheat in the spring, sometimes as late as May, and a light harrow is frequently run over the field immediately after scattering the seed. Hay is cut for one or two years, and the field may be pastured one year before being again plowed for corn. When the corn-field is not seeded to wheat in the fall, oats are usually sown in the spring. After the oats, wheat is seeded. A plan noted as being quite common is to disk the oat stubble in preparing for wheat instead of plowing. This seems to be especially advisable when the season is dry and the plow turns up large lumps which are difficult to crush. By disking two to four times a very good seed bed is secured. Clover is quite often plowed under for fertilizer and to loosen up the soil. Stable manure is applied to the sod to be plowed for corn, or on the oats stubble, which is to be prepared for wheat. Sometimes it is applied as a top dressing on the wheat fields. Manure spreaders are in common use. Commercial fertilizers are used to some extent.

In harvesting grain it is customary to thrash as much as possible from the field. Six or eight teams are used and a sufficient number of men to keep the machine running constantly. This method saves

one handling of the grain and the weather can usually be depended upon, so that very little is lost or damaged by rain.

"Hogging off" corn is practiced to a limited extent. This is accomplished by fencing off a small portion of the field at a time and turning the hogs in. They clean the patch quite thoroughly and eat many of the stalks until the corn is mature and the stalks become dry and tough. The usual method, however, is to let the corn mature, cut with harvester or by hand, husk in the field, and haul corn and stover to the barn. Some corn huskers are in use. Corn put in a silo is cut when just about mature and both stalk and ears are preserved for winter feed.

In the harvesting of all crops and in the cultivation of the fields the most improved and up-to-date machinery is used, and when not in use this machinery is housed and protected from the weather.

According to the census of 1900, the average size of farms is 85.6 acres, though they range from 20 to 1,200 acres. There are but few of the extremely large farms in the area. The same census states that 60.7 per cent of the farms were operated by their owners. In 1890 this was 78.5 per cent, while in 1880, 80 per cent of the farms were operated by their owners. This change is probably due, in part at least, to the fact that many of the farmers as they get into comfortable financial circumstances leave the farm to tenants and move into town. When farms are rented the share system is usually followed. The conditions, of course, vary, but when the tenant furnishes everything the landowner receives one-third of the crop as rent. When the landowner furnishes a portion of the stock and tools he receives more.

As a rule farm labor is not difficult to obtain. The usual wage by the month is from \$22 to \$25, with board, and it is sometimes stipulated that the hired man's driving horse shall be kept by the farmer. During haying and harvest time some day labor is required and a wage of \$1.50 is usually paid, though it is sometimes necessary to pay \$1.75. It is most difficult to secure labor during corn-cutting time.

The value of farm lands varies considerably, but generally speaking desirable places range from \$75 to \$150 an acre. Farms more remote from railroads or towns and in poor condition can be bought for considerably less, though such farms are comparatively scarce in this county.

Farmers derive a revenue over a portion of the county from the oil industry. At one time this gave a very substantial income to many, but in late years it has been greatly reduced, owing to decreased production.

Drilling was first begun in Duchouquet Township in 1885, the object being natural gas, but in this the effort was unsuccessful. Oil was discovered in attempting to extend the Lima field into Auglaize County. The field was extended until portions of the following townships were included: Duchouquet, Logan, Moulton, Washington, Salem, Noble, St. Marys, German, and Jackson. The best producers started as high as 600 barrels a day, but most of the wells began with less than 100 barrels a day. Gas was encountered with the oil at many places. This gas was piped to a large number of the farmhouses and is still used as light and fuel in many homes near the wells.

During the nineties the oil industry assumed proportions of considerable magnitude, and the growth of St. Marys was influenced more by it than any other town within the county. From 1891 to 1899, inclusive, 2,304 wells were sunk, and 84 per cent of these were producers.

Oil companies secured control by leasing the land from the farmers. The lease usually ran for twenty years and gave one-sixth of the oil produced as rent. The oil companies, of course, did all the work of drilling and handling the oil. Only a very few wells are being put down now, and the production from these is small. Many of the older wells have been abandoned because the field is practically exhausted. Those still being pumped yield from 1 to 2 barrels a day.

A careful survey of the agriculture of the county leads to the conclusion that the farmers as a class are in a prosperous condition; the methods followed are such as will maintain and tend to increase the productivity of the soil. It is suggested, however, that, as a general proposition, the dairy industry could be profitably extended. Since the yields of wheat are not satisfactory and since land values are so high, it would seem that the acreage devoted to this crop should be reduced. The extra land thus made available could be put out to corn and hay and support more extensive dairying, which industry affords a sure and steady income.

SOILS.

The soils of Auglaize County are derived from the mantle of glacial drift which covers this region to a considerable depth and extends far beyond the limits of the present survey. The underlying rocks have been buried so deep that they have no influence upon the various soils. The Niagara limestone forms the surface rock in the southern, northeastern, and northwestern parts of the county, while in the north-central part the Lower Helderberg limestone occurs. The following table shows the depth of the drift and

the several rock formations encountered in drilling for oil at St. Marys:

Formation.	Thickness in feet.
Glacial drift.....	110
Niagara limestone.....	175
Niagara, Clinton, Cincinnati, and Utica shales.....	877
Trenton limestone encountered at depth of.....	1,152

At St. Marys the Trenton limestone lies 313 feet below tide and at Minster about 269 feet, showing a fairly rapid rise to the south. At Wapakoneta the same rock is found at 348 feet below tide and at Cridersville, in the north part of the county, at 360.

The material composing the drift is not a promiscuous deposit of clay, sand, gravel, and bowlders, like much of the eastern glacial drift. Such materials are found in it, but with nearly as much regularity and order as is usually found in stratified rock. Resting on the rock is usually a heavy compact clay, though there is often found a layer of sand and sometimes gravel between the rock and clay. The layer of sand or sand and gravel, which furnishes water for most of the wells, is encountered at from 20 to 75 feet below the surface. Directly above this is a heavy blue boulder clay, which becomes a brown, yellow, or mottled color as the surface is approached. In pockets throughout this clay mass are found deposits of gravel and some bowlders are scattered through it. The gravel is most often found under the low ridges, the largest deposits being found in the St. Johns Ridge.

Bowlders are not common on the surface. They are usually altogether wanting in the level or undulating tracts, but in the vicinity of the ridges and on them, especially in the drainage valleys which intersect them, they are frequently found. Although the greater part of these are derived from the Devonian and Silurian limestone of northwestern Ohio, there are also some which must have had a more northern origin.

The glacial debris which covers this entire region has been influenced since its deposition by weathering and the action of water, until at present there are four distinct though closely related soil types, and these represent two series—the Miami and Genesee.

The Miami series, which occupies nearly all of the county, includes three types, the Miami clay loam, the Miami black clay loam, and the Miami gravelly loam. This series is found throughout Ohio, Indiana, Illinois, Iowa, Minnesota, Wisconsin, and Michigan. All of the types embraced are of glacial origin.

The Genesee series, which comprises the alluvial soils lying along the water courses throughout this region, is represented in the present survey by the Genesee loam.

The following table gives the names and areas of the several soil types shown in the accompanying map:

Areas of different soils.

Soil.	Acres.	Per cent.
Miami clay loam	207,424	81.7
Miami black clay loam	30,976	12.1
Genesee loam	15,488	6.1
Miami gravelly loam	192	.1
Total.....	254,080	

MIAMI CLAY LOAM.

The surface soil of this type consists of a light-brown silty loam or silt loam extending to a depth of 8 to 12 inches. The color varies considerably with the moisture conditions. Immediately after a rain, when there is the maximum amount of moisture present, the soil is of a dark-brown color, but when the surface becomes dry the soil is much lighter and often assumes a grayish hue. In the small depressions where organic matter has accumulated the surface is always darker than on the elevations. The texture varies slightly, but there is always present a high percentage of silt, which imparts to the soil a smooth feel.

The subsoil to a depth of 36 inches consists of a brown, yellowish or sometimes mottled, stiff, tenacious clay loam. There is frequently present in the subsoil below 24 inches a sufficient amount of fine angular gravel to impart a slightly gritty feel. In a few instances the gravel content increases with depth until a gravel bed is encountered. The areas under which gravel beds are found, however, are very small when compared with the extent of the type. At a depth of from 3 to 8 feet heavy, blue boulder clay is usually encountered.

Some difficulty is occasionally experienced in securing a good seed bed on this type, especially in the fall, when it is apt to be very dry. When plowed in this condition large clods, difficult to crush, are formed. If plowing can be done when moisture conditions are most favorable, there is but little difficulty in putting a field in good tilth.

The Miami clay loam is the most extensive soil in Auglaize County, occupying, as it does, 81.7 per cent of the area. The soil extends far beyond the borders of the county in every direction. It occurs with marked uniformity throughout this region, with the exception

of such changes as attend the varying drainage conditions in local areas.

Along the crest of the St. Johns Ridge the soil is of a lighter color than on the lower levels, but the texture remains the same. The subsoil contains more gritty material and gravel deposits are more frequent than elsewhere in the survey. On the roughest portion of this ridge, where the soil contains more gravel than over the greater part of its extent, the crops are apt to suffer more from continued dry spells than in the other parts of the county.

With the exception of the St. Johns Ridge the surface of the type is undulating or level. The natural drainage over the level sections is poor. Originally large areas were unfit for cultivation on account of their wet condition for a large part of the year. Many large open ditches and numerous tile drains have been put in, so that at the present time practically all of the type is drained naturally or artificially. In many places where the surface is undulating tile drains are found to be necessary.

The material from which the Miami clay loam is derived consists of unmodified drift which was laid down by the great ice sheet. This glacial material extends to a depth of about 100 feet, the thickness varying somewhat in different parts of the county. The drift material is of remarkable homogeneity, which accounts for the very extensive area of Miami clay loam and its uniformity of texture.

The type was originally timbered with maple, beech, oak, elm, ash, hickory, walnut, and some sycamore. The forests have gradually disappeared, until now only a comparatively small amount of land is in timber. Tracts of from 5 to 20 acres are scattered about the county and most farms have a small woodlot.

The Miami clay loam is considered a good general farming soil. Crops of wheat, oats, corn, and hay are grown extensively. While corn does not do as well on this type as it does on the Miami black clay loam, it nevertheless produces profitable yields, and is a very important step in the rotation. Sod is most often plowed for corn and a large amount of stable manure is usually applied before plowing. With proper care corn will yield an average of 40 bushels per acre. Yields range from 30 to 50 bushels. Wheat is not grown as extensively as formerly on this type and the yields are not as satisfactory as they were fifteen or twenty years ago. Yields range from 12 to 25 bushels per acre, with an average of about 16 bushels. The oat crop usually does very well, though for the last two years the season has been unfavorable during the spring and early summer. Forty bushels is a fair average yield, though yields of 60 bushels per acre are reported. The type is well adapted to the production of hay and yields from 1½ to 2 tons per acre. Alfalfa, while grown

to a limited extent, does not seem to be well adapted to this soil. Sorghum, millet, and Irish potatoes are also grown, but not extensively. Only sufficient fruit and garden truck are raised to supply the farms.

Farms on this type range in value from \$75 to \$150 an acre, depending upon location and improvements.

The following table gives the results of mechanical analyses of the soil and subsoil of the Miami clay loam:

Mechanical analyses of Miami clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
21652.....	Soil.....	0.4	2.2	2.5	9.2	10.0	55.8	19.4
21653.....	Subsoil.....	.4	1.6	1.9	7.3	11.4	43.7	32.9

MIAMI BLACK CLAY LOAM.

The surface soil of the Miami black clay loam, to a depth of from 10 to 12 inches, consists of a heavy loam or clay loam of a dark-brown or black color. It contains considerable silt and when wet becomes very sticky. When it is allowed to dry out after a rain without being cultivated, wide and deep cracks form in the surface. If plowed too wet, clods form and some trouble may be experienced in pulverizing them. Cultivated under the proper moisture conditions the soil works up readily into an excellent seed bed.

The subsoil consists of a heavy, sticky, waxy clay, so close and compact in structure that considerable resistance is offered to the passage of water. The upper subsoil is dark, nearly black, grading into a blue or drab heavy clay. In some places it has a dark-brown, yellowish, or mottled appearance. These latter conditions are most often found in the small areas where the soil is not typically developed.

The Miami black clay loam is most extensively developed in the southeastern part of the county. The largest area occurs in the southern and southeastern parts of Wayne and in the northern part of Goshen townships. Another area, though somewhat smaller, lies in the eastern part of Clay Township. Smaller tracts are found in the northern part of Washington and in the central part of Salem township along the St. Marys River. A great many still smaller areas are found throughout the county. Many of these were too small to be shown in the map.

This type is nearly always found in flat or basinlike areas. Narrow strips may also occur along some of the streams, especially near their sources. The drainage of such areas is usually more easily effected than that of the larger bodies lying remote from a drainage course.

The large flat areas and also the basinlike depressions were originally too wet to be cultivated, and it has been necessary to construct large open ditches and many tile drains in order to carry off the water. Practically all of these areas are now artificially drained and in a high state of cultivation.

The Miami black clay loam was formed in the areas of depression and poor drainage after the retreat of the ice sheet. These locations favored the growth of a great mass of vegetation, the decay and incorporation of which with the mineral matter is responsible for the resulting black soil.

When well drained this type is especially well adapted to the production of corn. The subsoil is usually abundantly supplied with moisture for the needs of the crop, and if the soil is worked under the most favorable conditions no trouble is experienced. It is necessary for the land to be thoroughly underdrained before the best results can be obtained. The underdrainage lowers the water table, which is the end desired. Wheat and oats do fairly well on this type, but as they are apt to produce too much straw and lodge, it is best to confine their production to the Miami clay loam.

Corn is by far the most extensively grown crop on this soil and yields of 80 bushels are sometimes obtained, though the yield usually ranges from 40 to 75 bushels. Wheat gives from 12 to 25 bushels, with an average of about 14 bushels. The yield of oats ranges from 30 to 50 bushels per acre. Hay also does well and yields from 1½ to 2 tons per acre. No trucking is done at present on the Miami black clay loam, but from the small gardens seen upon this type it is evident that such crops as onions, celery, and cabbage could be profitably grown on a commercial scale.

Farms composed of this type of soil range in value from \$100 to \$150 an acre.

The following table gives the results of mechanical analyses of soil and subsoil of the Miami black clay loam:

Mechanical analyses of Miami black clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
21656.....	Soil.....	0.5	3.3	3.9	7.4	3.9	42.2	38.8
21657.....	Subsoil.....	.0	.4	.9	3.7	5.5	46.1	43.1

MIAMI GRAVELLY LOAM.

The surface soil of the Miami gravelly loam, to a depth of from 6 to 8 inches, consists of a brown silty loam. There is present upon the surface and mixed with the soil a small amount of gravel from

one-fourth to 1 inch in diameter. The subsoil is a brown or yellowish clay loam, with a higher percentage of gravel than the surface soil. At 2 or 3 feet gravel beds are often encountered, and it is from these beds that most of the road building material is derived. The soil very much resembles the Miami clay loam, except that it contains from 5 to 15 per cent of gravel.

The type is of very small extent, there being less than 1 square mile in the whole area. It occurs chiefly on the St. Johns Ridge to the northeast of St. Johns as small patches from 2 to 15 acres in extent. These patches are usually on the crest of the ridge. The type is of glacial origin, as are all of the upland soils of the area.

The greater portion of the type is under cultivation and while the crops sometimes suffer from drought, fair yields are usually obtained.

As the type is of such small extent and of so little importance from an agricultural standpoint, no samples were taken for analysis.

GENESEE LOAM.

The surface soil of the Genesee loam, to a depth of from 10 to 14 inches, consists of a dark-brown or nearly black heavy loam or light clay loam, usually containing considerable silt. In the large areas the soil is of a darker color than in the small areas, for in the latter the lighter colored soil from the higher lands adjoining has been washed down and mixed with the alluvial material. This is noticeable along the border of the whole soil formation.

The subsoil consists of a heavy loam or clay loam which becomes heavier in texture but lighter in color with increased depth. The change from soil to subsoil is gradual, there being no sharp line of demarcation. The subsoil, while dark in its upper portion, grades into a brown, yellowish or sometimes a drab color before a depth of 36 inches is reached.

The soil of this type is easily cultivated when the moisture conditions are favorable. Some trouble is experienced, however, as much of it is subject to overflow, and the planting of crops is from this cause sometimes delayed.

The Genesee loam occurs as bottom land along the Auglaize and St. Marys rivers, and also along nearly all of the smaller streams of the county. The most extensive development is along the Auglaize River in Logan and Moulton townships and along the St. Marys River in Salem and Noble townships. In no place, however, do the bottom lands exceed one-half mile in width.

The Genesee loam is an alluvial soil, composed of glacial material reworked and redeposited by the streams along which it occurs. The surface is level or with only a slight descent toward the stream. Owing to its topography and low-lying position the natural drainage is deficient. Some open ditches have been constructed and tile drains

have also been put in, so that at the present time by far the greater proportion of the type is cultivated.

The original timber growth consisted of ash, elm, hickory, oak, and sycamore. The type is used for general farming, though corn is grown more extensively than any other crop. While wheat and oats are grown to some extent, the grain often lodges, and does not properly mature. Hay makes a rank growth, but is also apt to lodge.

Corn yields about 50 bushels per acre during favorable years. Forty bushels of oats is considered an average yield, while from $1\frac{1}{2}$ to 2 tons of hay are usually secured. Stable manure is not often applied to this soil, since the upland is usually more in need of fertilization.

There are no farms located entirely on this type, but in value it compares favorably with the Miami clay loam.

The following table gives the results of mechanical analyses of the soil and subsoil of the Genesee loam:

Mechanical analyses of Genesee loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
21646.....	Soil.....	0.0	1.0	0.5	3.2	6.0	61.1	27.9
21647.....	Subsoil.....	.0	.4	.3	3.4	11.8	54.8	28.8

SUMMARY.

Auglaize County lies in the west-central part of Ohio and comprises an area of 397 square miles, or 154,080 acres. The surface varies from level to rolling, the greater proportion being undulating. The most pronounced topographic feature is the St. Johns Ridge, which crosses the county from northeast to southwest, passing through the town of St. Johns, from which it takes its name. The average elevation of the area above sea level is about 875 feet. The county lies on the broad watershed between Lake Erie and the Ohio River.

The first settlement was made at St. Marys shortly before the war of 1812. At present all parts of the county are well populated and highly developed, forming one of the rich agricultural sections of the State. The dirt roads are mostly graveled or crowned with crushed rock, and the steam and electric roads afford adequate transportation facilities.

The climate does not differ materially from that of other Middle States sections in the same latitude. Extreme temperatures seldom occur, and the rainfall of 36.6 inches is well distributed throughout the year.

Corn, wheat, oats, and hay are the principal crops, and of these corn is the most extensively grown. While all soils of the area give good yields, the black land, Miami black clay loam, is especially well adapted to its growth. The Miami clay loam is well adapted to wheat, but continuous cropping has resulted in declining yields. The acreage is also being reduced. Oats and hay do well and are important crops.

Dairying, while engaged in by many, is not as highly developed as one would expect. There are but few silos in the county. A large creamery, worthy of special mention, is in operation at New Bremen. It is believed that the dairy industry could be profitably extended.

According to the federal census of 1900 the average size of farms at that time was 85.6 acres, and in the same year 60.7 per cent of the farms were operated by their owners.

The soils of the area belong to the Miami and Genesee series. The Miami soils are derived from the glacial drift, which covers this region to a depth of about 100 feet. The Genesee series comprises the alluvial soils formed by the reworking of the glacial material. Only four types of soil occur in the county.

The Miami clay loam is by far the most extensive type, and is remarkably uniform throughout the county. The surface is level or undulating, except upon the more pronounced part of St. Johns Ridge northeast of the town of St. Johns. Here the surface is rolling. This type is a good general farming soil.

The Miami black clay loam occurs in level or basinlike areas. The largest occurrences are in the southeastern part of the survey, though smaller patches are found throughout the entire county. It is an especially good corn soil.

The Miami gravelly loam is found chiefly along the St. Johns Ridge. It comprises very small areas, many of which were too small to map. It is underlain by gravel, which is used in road construction. Being of such limited extent it is of little importance from an agricultural standpoint.

The Genesee loam is an alluvial soil, and is found as bottom land along the St. Marys and Auglaize rivers and also to a limited extent along practically all of the smaller streams. Parts of the type are subject to overflow. It is a strong rich soil.

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